The Files - RD-125, T.O. 11 17 April 1959

25X1A9a [redacted]

Trip Report - CS-11 Collection System

1. On 23 March 1959 the undersigned and [redacted] 25X1A9
OC-SP/EA, visited the [redacted]
25X1A5a1 [redacted], Palo Alto, California, to monitor progress on the CS-11 Short-Range Collection System. Personnel participating in the discussions were:

25X1A5a1 [redacted]

25X1A9a [redacted] OC-SP/EA
- OC-E/R+D-EP

25X1A5a1 2. [redacted] had originally proposed a high-gain yagi antenna for the interrogation site. This antenna, though admittedly big (12 feet high and 15 feet along the beam), did give the 15 db gain over the entire 200 to 300 megacycle band which [redacted] felt 25X1A5a
was necessary to insure 98% reliability of their system. Acknowledging that operational conditions would not always permit use of such a large antenna, [redacted] alternately proposed a one-dimen- 25X1A5a
sional surface wave antenna radiating as an end fire unit. The boom length of this antenna is comparable to that of the yagi, in order to meet the requirement of at least 15 db gain across the band. The unique characteristic of this design is that where space is a prime consideration a section approximately 9 feet long may be removed from the center of the boom. The resulting antenna, six feet long, will provide at least 10 db gain. [redacted] 25X1A5a1
has also been investigating the feasibility of using one or more inflatable helical antennas at the interrogation site. One of these antennas, shown in attached photographs, is capable of providing approximately 8 db gain over the entire 200 to 300 mc range. However, in the event that wind loading is a problem, the light weight and large area of these antennas would make them almost unusable. When the original yagi design was presented to the Customer, and the large size found unacceptable, a decision was requested as to just how much size would be permissible in the interrogation antenna. It was felt that once the maximum allowable antenna size
25X1A5a1 was known, [redacted] design problem would be reduced to simply getting the most gain possible from an antenna within those dimensions and beefing up the rest of the system to take up the slack. Rather than a direct answer, however, the customer has suggested that the operational range requirement might be reduced from 25-30 miles to 5 miles. Approximately 16 db path loss would be eliminated by this

range reduction, thereby theoretically permitting the use of a dipole at the interrogating site to obtain the same system reliability originally aimed at over the 25 to 30 mile range. WDL was therefore requested to temporarily suspend work on design of the high gain interrogation antenna for the prototype system. WDL engineers are understandably opposed to the decision to reduce the range of the prototype system, feeling that some of the potential and some of the incentive for development of the system has been removed.

25X1A5a1 3. The [redacted] awarded the subcontract for the development of the CS-11 recorder to the [redacted] 25X1A5a1
Company in San Carlos, California. [redacted] is now contracted to 25X1A5a1
deliver one unit in 150 days from initiation of contract, and 2 additional units within 30 to 60 days after delivery of the first unit. This company appears to have a very good capability in the field of recorders, and especially in the design of small instrumentation quality recorders, of which the CS-11 is an extreme case. 25X1A5a1
On Monday, 23 March 1959, discussions were held with [redacted]
25X1A5a1 [redacted] to discuss their approach on the CS-11 recorder. Both men seemed to have a very realistic grasp of the problems involved in the project. Close
25X1A5a1 liaison between [redacted] will be maintained throughout the development.

25X1A5a1 4. [redacted] indicated that their development of the CS-11 components was far enough along to necessitate delivery to them of the GFE equipment which will be integrated into the system. Components which will be used in the system are the Time Event Marker (TEM), Signal Actuate Device (SAD), and the 60-Day Programmer. The TEM and SAD will be delivered to the contractor as soon as a model of each is available.

25X1A5a1 5. A newly developed [redacted] transistor is being used both in the data receiver and in the command receiver with very good results. The RF amplifier of the data receiver has been using a GE 7077 ceramic triode in order to reduce the noise figure to a respectable number. With this triode, noise figures of approximately 8 db had been obtained. [redacted] is now using their recently 25X1A5a1
developed transistor, the L5443, as the RF amplifier stage for this receiver. Initial tests indicate that the noise figure will be improved by 2 db and possibly even 4 db. The effect of using this new transistor in the command receiver is even more extreme. Because of the necessity of leaving the command receiver on constantly, the use of a transistor front end was mandatory. The best transistor available previously resulted in a noise figure for the command receiver, the noise figure drops down to approximately 6 db. This transistor is currently a laboratory item only, but full scale commercial production is planned in the near future.

6. The command signal presently proposed by [redacted] consists of an encoding sequencer and tone oscillators. The number of coding tones was reduced from 3 to 2 to simplify the sequencing circuitry by the elimination of 3 delay multivibrators. The present signal consists of 2 tones approximately 186 and 202 cycles per second which are transmitted for a period of approximately 200 milliseconds, each with a 200 millisecond blank interval between the tones. The security of the command signal should be good, with both frequency and time parameters involved in the command signal. Upon completion of the decoder, the complete command link will be tested for security and reliability. 25X1A5

25X1A5a1 7. [redacted] has objected to the use of the Government recommended Winchester connectors in the CS-11 system. The Winchester connectors are not sealed against water and [redacted] feels that the splash-proof requirement of the system cannot be met if they are used. As replacement items they have recommended the Viking miniature connectors which, though slightly larger than the Winchester connectors, are completely sealed from water at pressures up to 70 pounds per square inch. GFE equipment will use the Winchester connectors, however, it 25X1A5a1 is not known at this time what problems may exist in adapting the [redacted] developed CS-11 equipment to the Government equipment already available. This problem will be investigated and a decision reached before final assembly of the prototype modules. 25X1A5

8. It appears that the original [redacted] estimates on power required in the battery pack for 60-day operation of the CS-11 system fell short of the mark by 50% or more. In the last quarterly report it was anticipated that the weight of the individual battery package would be 5 pounds and would measure approximately 6" x 5" x 4" for operation down to 0°C. For temperatures down to 40° below centigrade, it would be necessary to parallel three such packs together. It now appears, with the new power estimates, that a package some 2 or 3 times larger than that will be required for operation down to -40°C. This is not a final figure, nor will such a figure be available until completion of all the system components. However, the data used in this new estimate should be considered to be more reliable than that used in the previously given estimate. If, as it now appears, the battery pack may need to have 2 or 3 times as much stored energy as previously estimated, the use of any batteries except the Yardney PM type silvercells would appear to be out of the question. 25X1A

9. The first prototype of the CS-11 system will be adjusted for operation in the 290 to 300 mc frequency band. In the final design, it will be necessary to have 3 operating frequencies in the 200 to 300 band. It is not known at this time which method will be used for setting up the additional frequencies on the equipment. There

is a possibility that this can be accomplished by simply changing crystals and tuning certain of the circuits. On the other hand, it may be necessary to have interchangeable RF heads for each receiver and transmitter. [redacted] has indicated that they have local signals of sufficient intensity to provide adequate radiation for testing purposes. The strongest local radiations appear to be in the L, S, and X bands.

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